The exploitation of forest resources in mountain areas during the Neolithic in the northeast of the Iberian Peninsula

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Summary: *The aim of this work is to analyze the variability in the use of firewood in mountain areas in northeast Iberian Peninsula. The data obtained from the charcoal analyses in Cova del Sardo (4550-2500 cal. BC) is compared with other sites located in the south side of the Pyrenees and Prepyrenees. Differences in altitude and latitude explain the main differences in the consumptions of firewood: in middle and high altitudes* Pinus sylvestris-nigra *type is dominant; whereas,* Quercus *sp. deciduous and* Buxus sempevirens *are the most important taxa at low altitudes.*

Key words*: Neolithic, NE Iberian Peninsula, firewood, mountain areas.*

INTRODUCTION

The aim of this work is to analyze the variability in the use of firewood in mountain areas by the first farming communities in the context of NE Spain. Changes in the charcoal record may be a result of landscape modifications, both from climatic or antropogenic causes, or of a variation in the strategies of exploitation of the vegetal resources. Between 5500-2200 cal BC landscapes would have undergone profound transformations that affected unequally the whole country. The first farming communities developed strategies for use of resources that could have a significant impact locally. The more permanent settlements, on the one hand, and the introduction and subsequent consolidation of agro-forestry and livestock economy, on the other, have certainly had an impact on biodiversity and on the organization of the firewood collection strategies. The study of relations between these societies and their environment thus becomes a central goal to understand how resources were exploited.

The increasingly large amount of data on the harvesting of firewood in NE Iberian Peninsula shows the diversity of taxa consumed and allows analyzing trends in the use of resources. The longitudinal, latitudinal and altitudinal variables, determined the variety of wood resources in the environment. For that reason, and with similar way of life, it is expected to find recurrences in the use of taxa in similar environments. However this is not the only variable to consider, so the occupation or activity represented in the site (short or long term occupation, specialized activity, hunting or herding, domestic space, burial space) may also have an important weight in the organization of use of resources.

DATA AND RESULTS

The Cova del Sardo shelter (1800 m asl), in the Valley of Boi (Lleida), was occupied between 5500-2500 cal. BC and later in historical times (Gassiot et al., 2010). In this paper, we discuss data obtained from charcoal analysis of levels ranging between 4550 and 2500 cal. BC. The data are compared with other Neolithic sites, in cave and open air, on the south side of the Pyrenees and Prepyrenees. Data from the Bauma del Serrat del Pont, La Draga (Piqué, 2000, 2002), Balma Margineda (Leroyer and Heinz, 1992), Feixa del Moro, Cova de l'Avellana, Cova 120, Plansallosa (Ros, 1996) and La Prunera (Ferré and Piqué, 2000) permits us to discuss and contextualize the variability in the use of firewood and its causes. The data are analyzed using the criteria of recurrence (ubiquity), frequency (number of remains), and diversity (number of taxa). We analyze, also, their relationship with the longitudinal, latitudinal, altitudinal variables and the type of settlement. The results of the charcoal analysis from Cova del Sardo show differences between the three phases documented. During the earliest phase (4650-4450 cal BC), the taxa used was *Pinus sylvestris-nigra*, *Salix/Populus* and *Corylus avellana*. Between 3500-4000 cal. BC *Pinus sylvestris-nigra* remains the best represented taxon, but now followed in importance by *Juniperus* sp. This trend continues in the latest phase, dated between 2750-2500 cal BC. Moreover, some taxa are used repeatedly in all phases: *Salix/Populus*, *Prunus* and *Quercus* sp. deciduous, while occupying a discreet place in quantitative terms. Another remarkable aspect is the increase in the number of taxa from the earliest phase to the most modern. While in the earliest phase has been documented the use of a minimum of 5 taxa, between 3500-4000 this number increases to 11 and in the most recent phase (2750-2500) 8 taxa are documented.

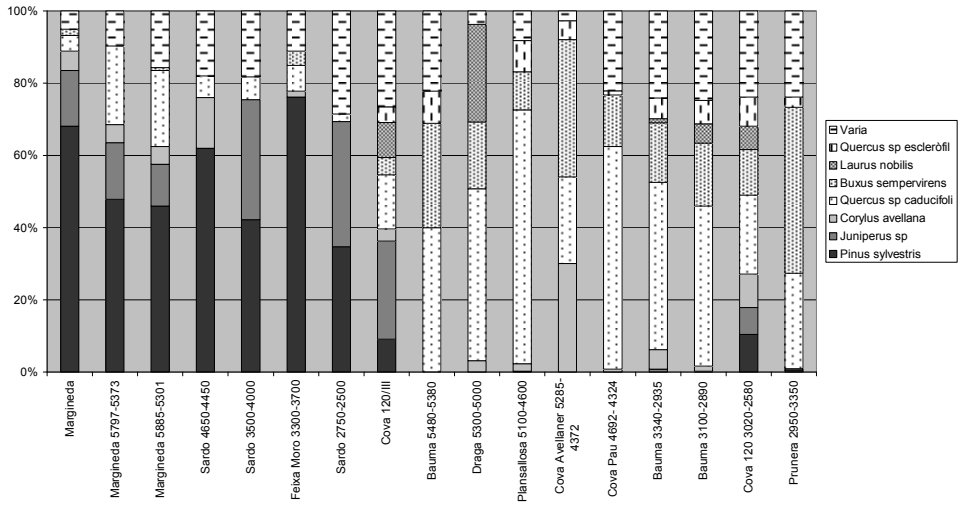

FIGURE 1. Results of charcoal analysis of Cova del Sardo in the context of sites in the South side of Pyrenees and Prepyrenees. Calibrated date BC is shown together the name of the site, from http://www.telearchaeology.com/c14/

DISCUSSION

Recurrence in the consumption of certain taxa may indicate certain continuity in regard to the catchment areas of the firewood and the species that grow there. In relation to other sites located between 970 and 1335 m asl some similarities can be documented concerning the consumption of certain species (Fig. 1). So, *Juniperus* and *Corylus* are also well represented in the early Neolithic occupations of Feixa del Moro and Balma Margineda, together with *Pinus sylvestris-nigra-uncinata typus*. The presence of *Quercus* sp. deciduous and *Abies* sp. is also documented. The results contrast, however, with those obtained for pre-Pyrenean deposits at low altitude. Thus, in La Bauma del Serrat del Pont, Cova 120, Plasallosa, La Prunera, Cova de l'Avellana, Cova d'en Pau and La Draga, all between 173 and 460 m asl, *Quercus* sp. deciduous and *Buxus sempervirens* are the best represented taxa in all phases (Fig. 1). It is also remarkable the recurring presence of *Quercus* sp. sclerophyllous, although always in small quantities. The altitude seems to be a crucial variable to explain the taxonomic distribution; without doubt reinforced by the easternmost location of these sites in relation to those of medium and high altitude, thus being more influenced by Mediterranean conditions. Altitudinal and latitudinal variables are therefore essential to understand the diversity of species represented in the sites. Conifers are most important in firewood collection strategies in middle and high altitudes, while deciduous and Mediterranean taxa are used mainly at low altitude sites.

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